

# Period-luminosity relationship for SX Phoenicis stars in Galactic globular clusters

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**Abstract** We compiled a list of about 250 SX Phoenicis stars known in Galactic globular clusters in order to study period-luminosity relation for this type of variable. The absolute magnitudes of these stars are derived using metallicity-luminosity calibration for RR Lyrae stars. The mixture of different radial and non-radial modes present in SX Phoenicis stars and the lack of unique method of mode identification cause the difficulties in defining strict period-luminosity relation. As a solution we propose to use confirmed double-mode radial pulsators.

## 1 Introduction, Database and Results

Although intrinsically fainter than Cepheids or RR Lyrae stars, SX Phoenicis variables are gaining increasing attention, because of their possible usage as distance indicators through the period – luminosity (PL) relation. They are short-period pulsating stars considered as a Population II counterparts of  $\delta$  Scuti stars and are found frequently in globular clusters (GCs). The existence of the PL relation for SX Phoenicis stars has been clearly established both theoretically [7] and empirically (e.g. [5]).

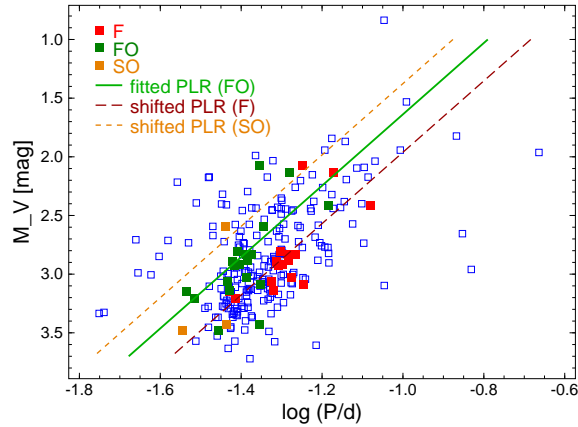
We performed an extensive search for SX Phoenicis stars in Galactic GCs searching the literature, a little-bit obsolete catalogue of SX Phoenicis stars in GCs [6] and revised but not complete version of the Catalogue of Variable Stars in GCs [1]. Altogether, 245 stars of this type with suitable photometric data located in 30 GCs were found including 19 double-mode radial pulsators.

The absolute magnitudes of the studied stars were derived using metallicity-luminosity calibration for RR Lyrae stars [3]. The average visual magnitudes of

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**Fig. 1** The period – luminosity diagram for analyzed SX Phoenixis stars. Double radial-mode stars are indicated with filled symbols. The solid line shows PL relation (PLR) for the first overtone (FO) mode obtained from the linear fit for the observed F/FO and FO/SO stars excluding two faintest stars (FO/SO pulsators from  $\omega$  Cen), which seem to be too faint for their periods.



the horizontal branch stars and cluster metallicities were taken from the Catalogue of Parameters for Milky Way GCs [4].

The resulting PL relation for all studied SX Phoenixis stars is shown in Fig. 1. The scatter is very large and no strict relation(s) can be defined. The main reason for this is surely the presence of stars pulsating in different modes, both radial and non-radial.

The PL relation can be defined only for stars pulsating in the same radial mode. Consequently, we first need to identify modes observed in SX Phoenixis stars. Unfortunately, there is no unique method of mode identification based on simple photometric parameters derived solely from the light curve. As a solution to this problem we made use of confirmed double-mode radial pulsators which can be quite easily identified through their period ratios. Now, evident separation between fundamental (F) and first overtone (FO) modes defining two parallel strips can be discerned in Fig. 1. Fitting line to the FO components yields the slope of  $-3.04$  which is very close to the recent determinations of this parameter (e.g. [2]).

## References

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